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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/047,707	01/15/2002	Young-Hoon Joo	5000-1-235	3893

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CHA & REITER
411 HACKENSACK AVE, 9TH FLOOR
HACKENSACK, NJ 07601

EXAMINER
CUNNINGHAM, STEPHEN C

ART UNIT	PAPER NUMBER
3663	

DATE MAILED: 09/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/047,707	JOO ET AL.	
	Examiner	Art Unit	
	Stephen C. Cunningham	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 June 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Specifically, the claim 2 limitation stating:

> a first circulator for transmitting the forward optical signal, received thereto via the optical fiber, to the first terminal of the first interleaver while transmitting the reverse optical signal, received from the **first** terminal of the **second** interleaver, to the optical fiber [emphasis added.]

According to claim 1, the second interleaver outputs the forward signal from the first terminal rather than outputting the reverse signal from the first terminal as in claim 2.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1, 2, 5, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uno et al. (JP 6-342952) In view of Radic et al.

With respect to claim 1, Uno teaches a bi-directional optical amplifier for amplifying WDM light comprising:

a first wavelength routing element (26) that combines wavelengths received at a first terminal and a second terminal and outputting a combined signal at a third terminal;

an optical fiber amplifier (10);

a second wavelength routing element (36) that splits the amplified signal, received at a third terminal, into the forward and the reverse optical signals at the first and second terminals, respectively (figure 8, abstract).

Radic teaches an optical amplifier that amplifies interleaved forward an reverse propagating signals. Interleaving forward and reverse propagating signals is beneficial because it reduces four-wave mixing. The presence of the interleaver in the apparatus suppressed both coherent and incoherent crosstalk. It would have been obvious to modify the apparatus of Uno by substituting three port interleavers for the first and second wavelength routing elements in order to route interleaved forward and reverse propagating signals through the unidirectional amplifier in order to minimize four-wave mixing (Results and Discussion, and figure 3).

With respect to claim 2, Uno teaches an amplifier comprising:

a first optical circulator transmits forward signals, received from the transmission fiber, to the first terminal of the first wavelength routing device (modified in view of Radic to be an interleaver); and transmits reverse optical

signals, received from the second terminal of the wavelength routing device (modified in view of Radic to be an interleaver), to the optical fiber; and

a second circulator transmits reverse signals, received from the optical fiber to the second terminal of the wavelength routing device (modified in view of Radic to be an interleaver); and transmits the forward optical signal, received from the first terminal of the wavelength routing device (modified in view of Radic to be an interleaver), to the optical fiber (figure 8).

With respect to claim 5, Uno teaches an optical amplifier device integrated into an optical fiber transmission system. The transmission system comprises:

an optical transmission fiber;

optical amplifier is adapted to receive forward and reverse optical signals bi-directionally from the transmission line; amplify the signals; split the amplified signals into the forward and reverse propagating signals; and transmit the forward and reverse signals via the transmission line.

It is inherent that that an optical transmission system comprises:

a first optical transmitter/receiver unit; and

a second optical transmitter/receiver unit.

Radic teaches an optical amplifier that amplifies interleaved forward an reverse propagating signals. Interleaving forward and reverse propagating signals is beneficial because it reduces four-wave mixing. The presence of the interleaver in the apparatus suppressed both coherent and incoherent crosstalk (Results and Discussion and figure 3). It would have been obvious to modify the

apparatus of Uno by substituting three port interleavers for the first and second wavelength routing elements in order to route interleaved forward and reverse propagating signals through the unidirectional amplifier in order implement an interleaved bi-directional transmission system to minimize four-wave mixing.

With respect to claim 6, Uno teaches a bi-directional optical amplifier for amplifying WDM light comprising:

a first wavelength routing element (26) that combines wavelengths received at a first terminal and a second terminal and outputting a combined signal at a third terminal;

an optical fiber amplifier (10);

a second wavelength routing element (36) that splits the amplified signal, received at a third terminal, into the forward and the reverse optical signals at the first and second terminals, respectively.

a first optical circulator transmits forward signals, received from the transmission fiber, to the first terminal of the first wavelength routing device (modified in view of Radic to be an interleaver); and transmits reverse optical signals, received from the second terminal of the wavelength routing device (modified in view of Radic to be an interleaver), to the optical fiber; and

a second circulator transmits reverse signals, received from the optical fiber to the second terminal of the wavelength routing device (modified in view of Radic to be an interleaver); and transmits the forward optical signal, received

from the first terminal of the wavelength routing device (modified in view of Radic to be an interleaver), to the optical fiber (figure 8, abstract).

Radic teaches an optical amplifier that amplifies interleaved forward an reverse propagating signals. Interleaving forward and reverse propagating signals is beneficial because it reduces four-wave mixing. The presence of the interleaver in the apparatus suppressed both coherent and incoherent crosstalk. It would have been obvious to modify the apparatus of Uno by substituting three port interleavers for the first and second wavelength routing elements in order to route interleaved forward and reverse propagating signals through the unidirectional amplifier in order to minimize four-wave mixing (Results and Discussion, figure 3).

2. Claim 3, 4, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uno et al. (JP 6-342952) In view of Radic et al. as applied to claims 1, 2 and 6 respectively above, and further in view of admitted prior art.

The applicant admits that dispersion compensation modules located adjacent to the amplifier module are well known in the art (instant application, figures 1 and 3, and page 3, line 14 through page 5, line 10. It would have been obvious to modify the apparatus by including a dispersion compensation module adjacent to the optical amplifier in order to reduce accumulated signal dispersion.

Response to Arguments

Applicant's arguments filed 6-30-03 have been fully considered but they are not persuasive.

Applicant argues that the Uno reference does not normally operate as a bi-directional amplifier, applicant points to figures 4 and 5 to support this assertion. This argument is not directed to the teachings of figure 8, on which the examiners rejection was based.

Applicant further asserts that if the Uno and Radic references were combined as suggested by the examiner about half of the channels would disappear due to interleaver characteristics and therefor it would have been impossible for one of ordinary skill in the art to have found it obvious at the time of invention. First, Applicant has asserted that half of channels would disappear due to interleaver characteristics but has failed to supply any evidence to support that conclusion. Second, the argument indicates that the combination teaches the claimed invention but that the combination is non-obvious because of the asserted reduction in usable bandwidth rather than questioning the examiner's motivation for combining the references. Assuming arguendo that the combination of Uno and Radic does in fact reduce the maximum useable bandwidth by about half, it is still foreseeable that minimizing four-wave mixing may take precedence over maximum useable bandwidth in certain situations.

Applicant argues that "interleaved bi-directional transmission generates large levels of coherent and incoherent cross talk at amplification nodes, which he illustrates at Fig. 2" and "the loop architecture necessarily introduces an excessive amount of loss that needs to overcome by an in-line amplifier..." Specifically, the Radic reference

teaches that cross talk is generated in the apparatus of figure 2 and by Rayleigh backscatter. The apparatus of Uno teaches isolators before and after the gain medium which prevent backscatter from being amplifier thus greatly reducing the power of backscattered light. The examiner believes that the arguments presented do not apply the amplifier structure taught by the Uno reference.

Applicant has improperly applied legal cases *In re Fritch*, and *In re Vaeck*.

Regarding *In re Fritch*, the examiner has provided a reasonable motivation to combine the Uno and Radic references. Applicant has failed to supply arguments directed toward overcoming the stated motivation.

Regarding *In re Vaeck*, Examiner has provided motivation which Applicant has not argued; there is a reasonable expectation of success; and the prior art references teach all of the claimed limitations.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen C. Cunningham whose telephone number is 703-605-4275. The examiner can normally be reached on Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas G. Black can be reached on 703-305-8233. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306 for regular communications and 703-872-9327 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1113.

scc
September 17, 2003

THOMAS G. BLACK
SUPERVISORY PATENT EXAMINER
GROUP 3600